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The first description of a male of *Paraplectana tsushimensis* (Araneae: Araneidae)

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Abstract — A male of *Paraplectana tsushimensis* Yamaguchi 1960 is described for the first time using specimen collected from Okinawajima Is. The mt-COI gene partial sequence data is used for the identification of the specimen.

Key words — taxonomy, *Paraplectana tsushimensis*, male, DNA bar-coding

The spider genus *Paraplectana* comprises 12 species described from Africa and Asia (Platnick 2011). Two species, *P. sakaguchii* Uyemura 1938 and *P. tsushimensis* Yamaguchi 1960, have been known to the Japanese fauna. It is difficult to find their male spider together with female in the field because of their rarity. The male specimens of *P. sakaguchii* were obtained by rearing juvenile spiders (Tanikawa & Harigae 2010). This has been the only description of the male of *Paraplectana*.

Recently I obtained an unknown *Cyrtarachnine* male specimen collected from Okinawajima Is. whose palpal structure was similar to that of *P. sakaguchii*. I analyzed a partial sequence of mitochondrial cytochrome oxidase subunit I gene (mt-COI) for identification. As a result, I concluded the specimen as *P. tsushimensis*. Here I describe the male of *P. tsushimensis* for the first time using this male specimen.

The voucher specimen of this study is deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo (NSMT). Nucleotide sequence data analyzed are available in the DDBJ/EMBL/GenBank databases.

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Identification of specimen

The male specimen in question was preserved in 75% ethanol for about 2 months before DNA extraction. The genomic DNA was extracted from whole cepharothorax using DNeasy Blood & Tissue kit (Qiagen, Inc.). The mt-CO1 partial sequence was amplified using the primer combination LCOI-1498: 5′-GGT CAA CAA ATC ATA AAG ATA TTG G-3′ with HCOI-2198: 5′-TAA ACT TCA GGG TGA CCA AAA AAT CA-3′ (Folmer et al. 1994). The reactants were initially denatured for 2 min at 95°C, proceeded with 40 cycles of 15 sec at 95°C, 20 sec at 47°C, 30 sec at 72°C. PCR product was purified using the ExoSAP-IT (GE Healthcare Bio-Sciences, Co. Ltd.). The purified PCR product was sequenced using the BigDye terminator cycle sequencing kit and analysed on ABI 3100 automated DNA sequencer (Applied Biosystems, Foster City, CA). Chromatogram was checked by eye. The obtained sequence, 640bp in length, was compared with those of allied species, including those of females of *P. tsushimensis*, in DDBJ/EMBL/GenBank database (see appendix). Sequence alignments were done by Clustal W program (Thompson et al. 1994) in MEGA version 4.0 (Tamura et. al. 2007). The phylogenetic tree was constructed by Neighbor Joining method using MEGA version 4.0 (Tamura et al. 2007). The obtained unrooted NJ tree is shown in Fig. 1. The specimen in question made a well supported monophyletic clade with *Parapletana tsushimensis*. Its p-distance (the number of nucleotide difference divided by total number of nucleotides) from five *P. tsushimensis* were 0.002–0.006, while those from the two *P. sakgaguchii* were 0.045–0.055. I concluded that the male specimen in question is conspecific with *Parapletana tsushimensis*.

Description

Paraplectana tsushimensis Yamaguchi 1960
[Japanese name: Tsushima-torinofundamashi]
(Figs. 2–3)

Paraplectana tsushimensis Yamaguchi 1960, p. 5, figs. A.1–7, B, pl. 1; Yaginuma 1968, p. 62, fig. 60; Yaginuma 1986, p.111, pl.28, fig. 7; Chikuni 1989, pp. 83, 217, fig. 62; Yin et al. 1990, p. 136, figs. 339–340; Chang 1996, p. 13, figs. 1–3. Yin et al. 1997, p. 386, figs. 278a–b; Song, Zhu & Chen 1999, p. 302, figs. 181R, 182D; Tanikawa 2007, p. 50, figs. 54–55, 462; Tanikawa 2009, p. 428, fig. 50.

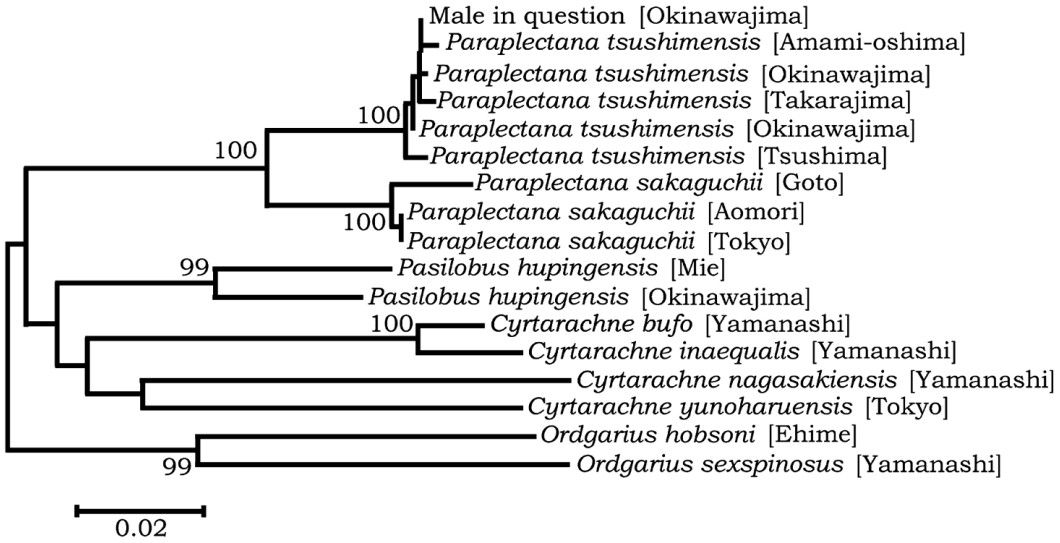

Fig. 1. Unrooted bootstrap consensus tree obtained by Neighbor Joining method for the species examined. Scores at each node are bootstrap values (1000 replicates, less than 90 omitted). Scale bar shows substitution per site.

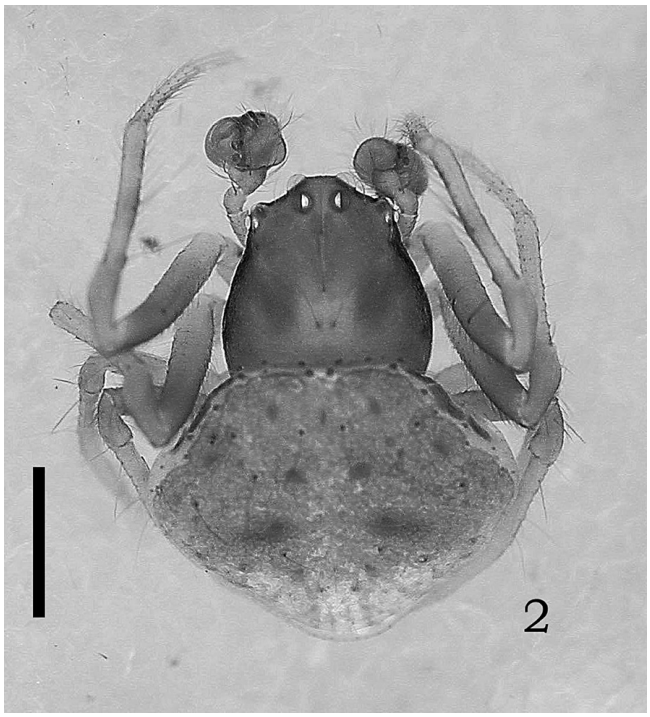

Fig. 2. Male of *Paraplectana tsushimensis* Yamaguchi 1960. (NSMT-Ar 9622; scale: 1 mm.)

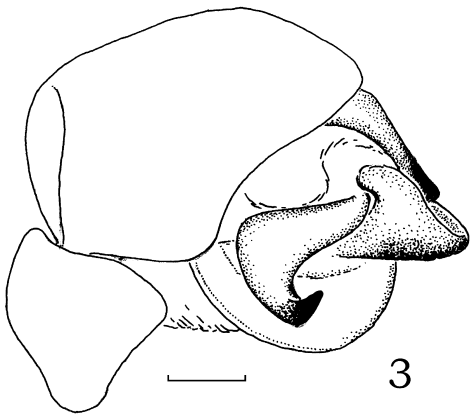

Fig. 3. Male palp of *Paraplectana tsushimensis* Yamaguchi 1960, prolateral view. (NSMT-Ar 9622; scale: 0.1 mm.)

Specimen examined. 1♂, Genka, Nago-shi, Okinawajima Is., Okinawa Pref., Japan, 2−V−2010, M. Sugimoto leg. (NSMT-Ar 9622)

Description of male. Coloration and markings. Carapace brown marginally darker; dorsum of abdomen brown, with darker spots at sigilla (Fig. 2)

Measurements (in mm). Body 2.83 long. Carapace 1.48 long; 1.30 wide. Length of legs [tarsus＋metatarsus＋tibia＋patella＋femur＝total]: I, 0.40＋0.77＋0.97＋0.58＋1.42＝4.14; II, 0.35＋0.68＋0.85＋0.55＋1.27＝3.70; III, 0.33＋0.48＋0.51＋0.37＋0.88＝2.57; IV, 0.30＋0.52＋0.67＋0.42＋1.10＝3.01. Abdomen 1.90 long; 2.28 wide.

Carapace slightly longer than wide (length divided by width 1.14). Median ocular area wider than long (length divided by width 0.79); wider in front than behind (anterior width divided by posterior width 1.24). Labium wider than long (length divided by width 0.63). Sternum almost as wide as long (length divided by width 0.98). Male palp (Fig. 3): embolus rostriform, median apophysis hook-shaped. Cymbium posteriorly with distinct depression. Length of leg I divided by length of carapace 2.80. Metatarsus and tibia of 1st and 2nd legs prolaterally with a row of weak spines. Abdomen wider than long [length divided by width 0.84, sigilla indistinct.

Distribution. Japan (Honshu, Shikoku, Kyushu, and Nansei Isls.), Taiwan, China.

Remarks. The male of *Paraplectana tsushimensis* resembles that of *Paraplectana sakaguchii*, but can be separated by the following features. 1) The apical part of median apophysis of *sakaguchii* is thinning (Tanikawa & Harigae 2010, fig. 4) but not in tsushimensis (Fig. 3). 2) Posterior part of cymbium is provided with a distinct depression in *tsushimensis* (Fig.3), but not in *sakaguchii* (Tanikawa & Harigae 2010, Fig. 4).

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Appendix. DDBJ/EMBL/GenBank accession numbers of sequence data analyzed in this study. Male in question was identified as *Paraplectana tsushimensis* in this study.

Species	Locality	Accession No.
Male in question	Okinawajima Is., Okinawa Pref.	AB627006
Paraplectana sakaguchii	Hachinohe-shi, Aomori Pref.	AB627002
Paraplectana sakaguchii	Hinode-machi, Tokyo Pref.	AB46976
Paraplectana sakaguchii	Goto-shi, Nagasaki Pref.	DQ518420
Paraplectana tsushimensis	Okinawajima Is., Okinawa Pref.	AB627003
Paraplectana tsushimensis	Tsushima Is., Nagasaki Pref.	AB627004
Paraplectana tsushimensis	Takarajima Is., Kagoshima Pref.	AB627005
Paraplectana tsushimensis	Okinawajima Is., Okinawa Pref.	DQ518422
Paraplectana tsushimensis	Amami-oshima Is., Kagoshima Pref.	DQ518423
Pasilobus hupingensis	Okinawajima Is., Okinawa Pref.	DQ518424
Pasilobus hupingensis	Ureshino-inoue-cho, Mie Pref.	DQ518425
Cyrtarachne yunonaruensis	Ome-shi, Tokyo Pref.	AB46975
Cyrtarachne nagasakiensis	Masuho-cho, Yamanashi Pref.	DQ518414
Cyrtarachne inaequalis	Masuho-cho, Yamanashi Pref.	DQ518415
Cyrtoarachne bufo	Masuho-cho, Yamanashi Pref.	DQ518421
Ordgarius hobsoni	Uchiko-cho, Ehime pref.	DQ518417
Ordgarius sexspinosus	Masuho-cho, Yamanashi Pref.	DQ518418